

## Municipal Separate Storm Sewer System (MS4) 2018 Annual Report

<b>A. Permittee Information</b>	
1. Name of MS4:	
2. Permit Number: - 9014	
<b>B. Minimum Control Measures</b>	
<b>1. Public Education and Outreach</b>	
1.1 Website address:	
1.2 Participation in Regional Outreach Strategy <input type="checkbox"/> No <input type="checkbox"/> Yes, summary of activities attached	
<b>2. Public Involvement and Participation</b>	
2.1 Participation in Regional Outreach Strategy <input type="checkbox"/> No <input type="checkbox"/> Yes, summary of activities attached	
<b>3. Illicit Discharge Detection and Elimination</b>	
3.1 Stormwater infrastructure mapping complete or continuing: <input type="checkbox"/> No <input type="checkbox"/> Yes	
3.1 Number of stormwater outfalls inspected:	
3.2 Number of stormwater outfalls tested:	
3.3 Number of illicit discharges detected and eliminated:	
3.4 Additional information attached <input type="checkbox"/> No <input type="checkbox"/> Yes	
<b>4. Construction Site Runoff Control</b>	
4.1 Continued implementation of an Erosion Control Ordinance <input type="checkbox"/> No <input type="checkbox"/> Yes	
4.2 Additional information attached <input type="checkbox"/> No <input type="checkbox"/> Yes	
<b>5. Post Construction Management for New Development and Redevelopment</b>	
5.1 Continued implementation of an ordinance for disturbances of greater than one acre that are not subject to the Agency's post-construction permit program <input type="checkbox"/> No <input type="checkbox"/> Yes	
5.2 Additional information attached <input type="checkbox"/> No <input type="checkbox"/> Yes	
<b>6. Pollution Prevention and Good Housekeeping</b>	
6.1 Participation in the Municipal Compliance Assistance Program <input type="checkbox"/> No <input type="checkbox"/> Yes; Participation year:	
6.2 Number of catch basins inspected:	
6.3 Number of catch basins cleaned:	
6.4 Lane miles swept:	6.5 Cubic yards of material collected by street sweeping:
6.6 Number of staff who attended training:	
6.7 Additional information attached <input type="checkbox"/> No <input type="checkbox"/> Yes	
<b>C. Flow Restoration Plan Implementation</b>	
1. Summary of FRP implementation in stormwater impaired waters is attached: <input type="checkbox"/> NA <input type="checkbox"/> Yes	
<b>D. Phosphorus Control Plan Implementation</b>	
1. Has a Road Erosion Inventory (REI) been completed for your municipality? <input type="checkbox"/> NA <input type="checkbox"/> No <input type="checkbox"/> Yes	

**E. Incorporated Previously Permitted Stormwater Systems**

1. Has the municipality incorporated permitted stormwater systems into its MS4 authorization? ☐ No ☐ Yes

2. If yes, complete the following table or include this information as an attachment

Stormwater Treatment Practice Name	State Stormwater Permit No.	Date of Last Inspection	Maintenance Completed
			<input type="checkbox"/> NA <input type="checkbox"/> Yes
			<input type="checkbox"/> NA <input type="checkbox"/> Yes
			<input type="checkbox"/> NA <input type="checkbox"/> Yes
			<input type="checkbox"/> NA <input type="checkbox"/> Yes
			<input type="checkbox"/> NA <input type="checkbox"/> Yes
			<input type="checkbox"/> NA <input type="checkbox"/> Yes
			<input type="checkbox"/> NA <input type="checkbox"/> Yes
			<input type="checkbox"/> NA <input type="checkbox"/> Yes
			<input type="checkbox"/> NA <input type="checkbox"/> Yes
			<input type="checkbox"/> NA <input type="checkbox"/> Yes
			<input type="checkbox"/> NA <input type="checkbox"/> Yes
			<input type="checkbox"/> NA <input type="checkbox"/> Yes

**F. Other Reporting Requirements**

1. Summary of stormwater activities planned for next reporting cycle:

2. Proposed changes to the SWMP:

3. Reliance on other entities to meet permit obligations:

**G. Certification**

This Annual Report shall be signed by a principal executive officer, ranking elected official or other duly authorized employee consistent with 40 CFR §122.22(b) and certified as follows:

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

\_\_\_\_\_  
Print Name

\_\_\_\_\_  
Title

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

## **B.1.1 & B.2.1**

Public Education and Outreach  
&  
Public Involvement and  
Participation Activities



**MCM #2**  
**Rethink Runoff Stream Team**  
**2018 Summary of Activities**

## **Social Media**

### **Facebook**

- 219 total “likes”- a 23% increase from 2017 (177 in at end of 2017)
- 222 total “follows” (29 posts this year)

### **Instagram**

- 120 total “follows” (13 posts this year)

## **RRST Website**

- See final report from Dave Barron (Pluck Design)

## **Newsletter and e-correspondence**

- As of 11/28/18, there were **508** subscribers to the RRST newsletter which is an 8% increase in 2018 (from 467 in 2017) It is the highest subscription to date. The average open rate for emails was 24%
- Arbor Day Volunteer Solicitation Email Published on 4/4/18 Opens: 99 Clicks: 7
- Summer Newsletter Published 9/13/18 Opens: 97 Clicks: 6
- Fall Newsletter Published on 11/18/18 Opens: 125 Clicks: 17

## **Organizational Partnerships**

The Rethink Runoff Stream Team partnered with 18 different organizations in 2018 (15 non-municipal partners, 3 municipal partners)

- Vermont Community Garden Network (Organized state-wide Day in the Dirt event which resulted in 10 volunteers signing up to help with Rain Garden Cleanup at the Coast Guard station)
- VHB (Rain Garden Cleanup)
- Winooski Valley Parks District (Provided land for S. Burlington Arbor Day tree planting, also hosted the Conservation Field Day)
- US Fish and Wildlife (Cost share on trees for Arbor Day)
- Williston Central School (students volunteered for Arbor Day tree planting)
- Lake Champlain Basin Program (Provided funding for much of Arbor Day tree planting event)
- Intervale Conservation Nursery (Supplied trees and staff for Arbor Day tree planting)
- South Burlington NR Committee (Helped with the Trees For Stream planting on Muddy Brook)
- Community Sailing Center (Invited RRST to participate in an on-board education program during the Maritime Festival)
- Chamberlin School - S. Burlington - (A stormwater lesson was taught to Chris Provost’s 4th grade class at the as part of a field trip at the Community Sailing Center in Burlington)



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- Milton Youth Coalition (Provided tabling opportunity for RRST at Milton Activities Fair)
- Shelburne Farms (Provided tabling opportunity for RRST at Shelburne Harvest Festival)
- VT DEC (La Rosa Program funded WQ sampling lab analysis)
- ECHO (Provided tabling opportunity for RRST in the museum during Clean Water Week)
- Colchester High School (students volunteered to stencil storm drains in Colchester as part of an AP Environmental Science project)
- Burlington Parks and Rec (Provided tabling opportunity for RRST at Kid's Day)
- Winooski Department of Recreation and Parks (Provided tabling opportunity for RRST at Winooski Wednesdays event)
- Winooski DPW (Assisted in selection of storm drain mural locations, cleaned catch basins and provided day-of support to artists)

## Media

The Rethink Runoff Stream Team had **six** media appearances in 2018, exceeding the work plan goal of five articles:

- Article: Call for Tree Planting Volunteers: Williston Observer & The Other Paper (April)  
<http://www.willistonobserver.com/streambank-tree-planters-needed/>  
<http://otherpapersbvt.com/community-tree-planting-event-celebrate-arbor-day-with-your-friends-and-neighbors.html>
- Article: The Citizen - Survey Results (May)  
<http://www.thecitizenvt.com/2018/05/03/survey-shows-increased-awareness-stormwater-runoff-problem-solutions/>
- Article: Call for Stream Team Volunteers, Williston Observer (June)  
<http://www.willistonobserver.com/chittenden-county-water-quality-volunteers-needed/>
- TV Coverage: Clean Water Week (August)  
<http://www.wcax.com/content/news/Lend-a-hand-with-nonpoint-water-pollution-489666141.html>
- TV Coverage: Winooski Storm Drain Mural Project (October)  
<https://www.wcax.com/content/news/Winooski-mural-aims-to-educate-on-stormwater-pollution-496723301.html>
- TV Coverage: Burlington Storm Drain Stenciling (October)  
<https://www.mychamplainvalley.com/news/protecting-vermont-s-water-by-rethinking-runoff/1510638055>



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## Outreach

Outreach includes any educational opportunities or tabling events where resources or information are provided to the community about the RRSST program. There were **seven** outreach events in 2018, with an estimated total outreach to **470** people.

Outreach events in 2018 targeted the municipalities of **Milton, Shelburne and Burlington. Winooski** carried over from last year due to a venue cancellation experienced in 2017.

- **Burlington** Kid's Day (5/5/18) 150 people reached
- **Burlington** Clean Water Week Tabling at ECHO (8/1/18 & 8/2/18) Reached 117 people total (35 from our 9-municipality area)
- **Burlington** Lake Champlain Maritime Festival. In partnership with the Community Sailing Center, Rethink Runoff took our education ON the lake. The Rethink Runoff coordinator sailed aboard a small sailboat with 4 community members and shared information about the watershed and how to get involved with Stream Team. 3 adults, 1 kid reached
- **Shelburne** Harvest Festival (9/15/17) 61 adults, 77 kids reached
- **Winooski** Wednesdays (9/5/18) Reached 12 adult Winooski residents and 8 kids
- **Milton** Activities Fair (9/27/18) Reached 40 adults and 60 kids from Milton Brought 'Build a Rain Garden' activity and information about green lawn care
- **Burlington and Colchester:** Storm Drain Stencils were loaned to Jenna Olson and Karen Adams for independent projects. 39 drains marked. 20 students reached

The 2018 work plan goal for outreach participation was 400 people, which was surpassed. A total of **470** people that were engaged in outreach and educational opportunities in 2018. Chosen outreach towns for 2019 are Essex, Essex Junction, and Colchester.

**New Outreach Activity Created:** Stream team coordinator, Kristen, created a new activity to bring to tabling events to engage kids and families. The activity is called "Design Your Own Rain Garden." Using a tray of dirt and laminated pictures of plants that thrive in VT rain gardens (taped on toothpicks), participants can imagine in 3-D space what a rain garden might look like in their own backyard or school. The activity has been a hit so far. To engage adults, the coordinator brought pamphlets about green lawn care and a booklet about how to build a rain garden.



Figure 1: Build-a-Rain Garden Activity at a tabling event at ECHO



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## Event-Driven Tasks

There were **seven** hands-on events held in 2018. Event-Driven Tasks involve community members in some form of hands-on engagement. This most often means volunteering, but can also include hands-on education activities with school groups.

- Rain Garden Clean Up at Burlington Coast Guard Station (4/28/18)
  - Partnered with VT Community Garden Network to carry out this event
  - 10 volunteers
- Trees for Streams Arbor Day Planting: Williston (5/4/18)
  - Partnered with Winooski Valley Parks District, The Intervale Conservation Nursery, US Fish and Wildlife, The Lake Champlain Basin Program and Williston Central School to carry out this event
  - 50 volunteers (36 students, 14 adults)
  - 560 trees planted along Allen Brook
- Trees for Streams Arbor Day Planting: South Burlington (5/4/18)
  - Partnered with Winooski Valley Parks District, The Intervale Conservation Nursery, US Fish and Wildlife and The Lake Champlain Basin Program and to carry out this event
  - 22 volunteers
  - 840 trees planted along Muddy Brook
- Conservation Field Day at Ethan Allen Homestead (5/16/18)
  - Reached 71 students from S. Burlington, Colchester and Essex
  - This environmental education event was hosted by WVPD at Ethan Allen Homestead in Burlington. 5th grade students from regional schools spent the day rotating through a series of workshops focused on conservation stewardship. RRST coordinator taught a workshop about stormwater
- Stream Team Water Quality Volunteer Training Day at WNRCD office (7/9/18)
  - 14 people trained, materials distributed for stream sampling
- Stormwater Lesson with Chamberlin School at the Community Sailing Center (CSC)
  - 26 students (4th graders from S. Burlington) participated in a field trip at the CSC. Kristen provided 1.5 hours of watershed education at the end of the sailing segment. Students used markers and paper to trace the watershed around their school, sung a song about watersheds and interacted in small groups with hands-on watershed models. They experimented with what happened when “rain” from a spray bottle hit different surfaces and then distributed “pollution” (sprinkles, confetti, etc.) on the landscape to see where it would flow.
- Winooski Storm Drain Mural Project - Winooski (10/10/18)
  - Partnered with the Winooski DPW and local artists to carry out this event
  - 3 artists painted a total of 2 murals. Artists reported speaking to about 75 people about the project while they were out painting.



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Hands-on participation events in 2018 targeted the towns of Winooski, South Burlington, and Williston. Details about engagement in those communities can be seen above.

A total of 74 people participated in hands-on RRST events in 2018. A total of 94 people volunteered their time in a RRST activity in 2018; just falling short of the 100 volunteer goal. Chosen project towns for 2019 are Burlington, Milton, and Shelburne

## RRST Outreach Demographic Impacts

The table on this next page displays the interaction from each of the nine MS4 communities at tabling events and 2018 project events and workshops. Please note: this is not a comprehensive list of all 703 people reached, as town residence was only acquired when offered.

Town	# of participants
Burlington	255
Colchester	25
Essex Town	20
Village of Essex Junction	10
Milton (O)	100
Shelburne (O)	58
Williston*	59
South Burlington*	81
Winooski* (O)	95
TOTAL	703

**Table 1: Interaction with RRST by member town ( \* = 2018 project towns (O) = outreach town)**



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## City of Winooski Project: Storm Drain Murals

RRST coordinated a storm drain mural event for the City of Winooski in 2018. A “call for artists” was published by the Essex Reporter on May 31, 2017 and the opportunity was shared with artists involved in past RRST projects. Four concepts were submitted by two artist teams and two were selected to be painted around catch basins pre-selected with guidance from the City’s Public Works Department.

On the morning of October 10, 2018, the three artists, Holly Greenleaf, Rachael Forando, and Stephen Welter were stationed at their assigned catch basins: Holly at the catch basin outside Chick’s Market at the corner of River St and Hickock St. and Rachael and Stephen as an artist team on Winooski Falls way by the bus stop. The artists signed contracts stipulating the requirements and procedures they had to adhere to in order to participate in the project. Instead of traffic paint, self-priming porch and floor enamel was used by all artists. Public Works staff assisted with thoroughly cleaning the areas to be painted and ensuring safety of the artists by providing traffic cones and vests. All murals were completed by the end of the day. Throughout the day, the RRST coordinator checked in with the artists. Each artist was given a pack of Rethink Runoff stickers and a mailing list sign up sheet. Artists reported speaking with about 75 passers-by about the project. They gave away about 30 stickers, and 2 people signed up for the mailing list. WCAX covered the story (see link in Media list above) and Facebook likes and shares were higher for this post than any other post in RRST history. About 2,800 people digitally interacted with the post.

The total estimated cost to plan, manage, and implement this project was **\$1,411**. The approximate personnel time used to plan and execute the project was 20 hours (\$900). The artists were paid a \$250 stipend each; a total of \$500. The mileage was about \$11.



**Figure 2: Winooski murals (Chick’s Market: artist Holly Greenleaf, left Winooski Falls Way: artists Rachael Forando and Stephen Welter, right)**



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## Town of Williston Project: Arbor Day Community Riparian Buffer Planting

On May 4, 2018, 50 community volunteers (including 36 students from Williston Central School) joined a crew from The Intervale Center at Allen Brook behind the Williston Central School soccer fields in Williston to plant native trees along the bare banks of this stretch of river. Volunteers planted 560 trees, covering 1.4 acres of river with native vegetation.

Prior to the volunteer day, RRST coordinator used funds from the Lake Champlain Basin Program (LCBP) Trees for Streams grant to scope sites and secure landowner agreements for the planting projects. RRST money was used to solicit volunteers and coordinate the volunteer work days on the day of the planting event.

The estimated cost to RRST to plan and carry out the tree planting event was approximately **\$1,530**. Supplies, including trees and tree protection, were purchased with funds from the LCBP grant and cost-share from the US Fish and Wildlife Partners. Personnel time used to plan and execute the project was roughly 33 hours or \$1,400. Refreshments were approximately \$30 and mileage was approximately \$15.



*Figure 3: Volunteers in Williston plant trees along Allen Brook on Arbor Day, 2018 (5/4/18)*



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*Figure 4: Some major partners for both Arbor Day Riparian Buffer Planting Projects*

## **Town of South Burlington: Arbor Day Community Riparian Buffer Planting**

On May 4, 2018, 16 community volunteers joined RRST coordinator and a crew from The Intervale Center at Muddy Brook Wetland Reserve in South Burlington to plant native trees along the bare banks of this stretch of river. Volunteers planted approximately 400 trees, covering one acre of river with native vegetation.

Prior to the volunteer day, RRST coordinator used funds from the Lake Champlain Basin Program (LCBP) Trees for Streams grant to scope sites and secure landowner agreements for the planting projects. RRST money was used to solicit volunteers and coordinate the volunteer work days on the day of the planting event.

The estimated cost to RRST to plan and carry out the tree planting event was approximately **\$1,530**. Supplies, including trees and tree protection, were purchased with funds from the LCBP grant and cost-share from the US Fish and Wildlife Partners. Personnel time used to plan and execute the project was roughly 33 hours or \$1,400. Refreshments were approximately \$30 and mileage was approximately \$15.



*Figure 5: Volunteers in S. Burlington plant trees along Muddy Brook on Arbor Day, 2018 (5/4/18)*

## **Water Quality Monitoring Program Summary**

RRST has maintained an ongoing water quality monitoring program since 2012. These urban or suburban streams are impacted by sedimentation, excessive nutrient loading, high temperatures, bacteria, and other pollution. With another year of support from VT DEC's LaRosa program, RRST collected biweekly water quality samples at twenty three sites on twelve streams in 2018 (an increase by five sites and three streams from 2017). Thirteen volunteers and one intern helped collect grab samples on five, biweekly Tuesdays from 7/10 - 9/4. Grab samples were analyzed for turbidity, total phosphorus, and chloride. These parameters were also sampled at five of the sites during one rain event on 8/18. See the 2018 Water Quality Monitoring



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Report in Appendix A for more information.

The training day for citizen science samplers took place on 7/9/18. RRST coordinator demonstrated sampling procedures, described the data collection sheets and answered questions. Throughout the season, volunteers returned their samples to the WNRCD office after sampling, and the RRST coordinator ensured all samples were accounted for and delivered to the UVM lab. All volunteers received a hand-written thank-you card at the end of the sampling season. A volunteer appreciation event is planned for spring 2019. Volunteers expressed an interest in having an educational experience, rather than a pizza party, so the plan is to host a tour of the Essex Wastewater Treatment Plant, followed by snacks.

New this year, the RRST coordinator sent bi-weekly emails to WQ volunteers to check in about sampling procedure and share interesting local water tidbits. This frequent communication was well received by the volunteers. The coordinator also solicited feedback on the training materials and field data sheets and made significant edits for 2019 to improve clarity.

WNRCD sponsored an (unpaid) water quality intern for the sampling season. James Mazzola, a recent graduate, helped collect 5-8 samples each sampling day. He also helped the RRST coordinator scope the five new sampling sites for safety and suitability and helped update directions for all sites, adding pictures and more descriptive landmarks.

<i><b>Stream</b></i>	<i><b>Location</b></i>	<i><b>Site ID</b></i>	<i><b>Lat / Long</b></i>
<b>Centennial Brook</b>	Grove Street in Burlington (by the parking lot for Schmanska Park)	Centennial 10	44.48453, -73.18423
	Patchen Road in South Burlington (through cemetery)	Centennial 20	44.47402, -73.17334
<b>Indian Brook</b>	Parking lot B of Essex High School	Indian 10	44.49668, -73.11093
	Lang Farm in Essex	Indian 20	44.50442, -73.09190
<b>Malletts Creek</b>	McMullen Road	Milton 10	44.60855, -73.10693
<b>Munroe Brook</b>	Route 7 and Bay Road (by Red Apple Motel)	Munroe 10	44.40532, -73.21735
	Spear & Webster Intersection (just south of Kwiniaska Golf Course)	Munroe 20	44.38984, -73.20103
<b>Morehouse Brook (one old site: 10 one new site: 20)</b>	Landry Park Winooski (Eastern trib)	Morehouse 10	44.50035, -73.19226
	Landry Park Winooski (main branch - west of Morehouse 10)	Morehouse 20	44.50041, -73.19444
<b>Muddy Brook (20- site changed for safety)</b>	River Cove Road in Williston	Muddy 10	44.47293, -73.13505
	S. Brownell Road Williston	Muddy 20	44.44196, -73.13228
	Van Sicklen Road in Williston	Muddy 30	44.42823, -73.14622
<b>Potash Brook (40 - site changed for safety)</b>	Kindness Court in South Burlington near Humane Society	Potash 10	44.44572, -73.21348
	Farrell Street in South Burlington near	Potash 20	44.44660, -73.20415



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	Klinger's Bakery		
	Dorset Street in South Burlington	Potash 30	44.45150, -73.17849
	Kimball Ave South Burlington	Potash 40	44.45394, -73.14809
<b>Engelsby Brook</b>	Pine St in Burlington near Champlain Elementary Community Gardens	Engelsby 10	44.45627, -73.21394
	Behind UVM Redstone Campus in Burlington	Engelsby 20	44.46654, -73.19741
<b>Alder Brook (new)</b>	Off Chapin Road in Essex	Alder 10	44.51742, -73.06559
<b>Bartlett Brook (new)</b>	By Shearer Chevrolet in South Burlington	Bartlett 10	44.42596, -73.21345
<b>Sunnyside Brook (new)</b>	Mountain View Drive in Colchester	Sunnyside 10	44.50654, -73.17823
<b>Sunderland Brook (new)</b>	In Pearl Street Park in Essex Junction	Sunderland 10	44.50179, -73.12983
	Off Pine Island Road in Colchester	Sunderland 20	44.51685, -73.20421

**Table 2: 2018 Stream Sampling Site Locations**



**Figure 6: Volunteers sampling at Indian 10, Indian 20 and Muddy 30 on 8/7/18**

Town	Number of Stream Team Volunteers
Essex Junction	3
Colchester	2
S. Burlington	2
Burlington	2
Williston	2
Shaftsbury	1
Hinesburg	1

**Table 3: Stream Team Water Quality Sampling Volunteers by town**



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## Adopt-a Rain Garden Program Summary

The Stream Team's Adopt-a-Rain Garden program is an opportunity for individuals to assist in keeping Chittenden County's public rain gardens functional and attractive. This involves basic maintenance activities like picking up trash, pruning, pulling weeds, installing new mulch, and informing the coordinator of non-functioning gardens. There are currently eleven public rain gardens managed by RRST. In 2018, there were four official adopters, but about 10 community members volunteered time to clean the Coast Guard Station garden this year as part of the Vermont Community Garden Network's Day in the Dirt event. Efforts will be made in 2019 to find individuals or groups to adopt all gardens.

This summer, the RRST coordinator visited all the gardens to remove out of date signage. The signs will be re-laminated with the current RRST logos and information and will be returned next spring. The re-branding of the signs has been organized by Dave Barron of Pluck Designs.

An assessment of each garden was conducted in summer 2018 and the status of each is provided below.:

### Callahan Park Rain Garden

**Location:** 45 Locust St., Burlington

This garden has been functioning well for some time thanks to efforts by Brad Ketterling, who has adopted this garden for several years. In 2017, Burlington Public Works brought a load of mulch to the garden and Brad spread the mulch and kept up with weeding and monitoring the garden. Several, understory shrubs and flowers have been shaded out by larger, over-story plants that need to be thinned. There are several locations that also need to be replanted, so efforts will be made to locate surplus plants that can be added in 2019.

### Chamberlain School

**Location:** 262 White Street, South Burlington

This garden was installed in partnership with WNRCD and the Let it Rain Program in 2013. This is one of several rain gardens on the grounds of Chamberlain Elementary. School teacher Chris Provost adopted this garden again in 2018 and has actively maintained it for several years.

### Coast Guard Station

**Location:** Depot Street, Burlington

This small garden is located in the parking lot abutting the bike path next to the Burlington Coast Guard Station. In 2014, RRST worked with the ECHO summer kids program to engage elementary school children in cleaning the garden and in 2015 a local resident, Wiley Reading, adopted the garden. The garden did not



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have an adopter from 2016-2018, but this garden got a “boost” of energy from 10 community volunteers through the Day in the Dirt event hosted by the Vermont Community Garden Network in spring of 2018. It is in good condition. Efforts will be made to find a volunteer for 2019.

### **Correctional Facility**

**Location:** 7 Farrell St., South Burlington

This garden is visible from the road and appears to be functioning well. Originally, employees of the prison adopted this garden and would occasionally clean the garden with inmates. There has been a lot of staff turnover in the past few years without a clear adopter. No formal adoption of this garden was made in 2018. MS4 representative, Tom DiPietro, has been in communication with Correctional Facility staff about proper maintenance. He will continue to be the main contact for 2019, with support offered from The Stream Team as needed. There is not a RRST garden sign at this garden, but one will not be installed here as visiting the area is discouraged.

### **Farrell Park**

**Location:** Swift Street, South Burlington

This garden is unique in terms of its design. It is called an “advanced wetland stormwater filter” and was installed in 2012. Stormwater enters the garden through an inlet, flows through the gravel wetland filter media, is cleaned and exits through other end. The garden requires very little maintenance because it has a flushing system that prevents sediment from building up. This garden had an active adopter for its entire life, until 2015 when the adopter moved away. The garden was never in need of additional plants or maintenance. It would not be appropriate to add mulch to this garden. RRST would like to find another adopter in 2019, primarily to weed the site and to bring any issues to our attention.

### **Landry Park**

**Location:** North St., Winooski

This garden was constructed in 2006 as two, separate gardens along the narrow strip of grass between a fence at Landry Park and the road. Over the years, the gardens have become overgrown, but Winooski DPW officials believe it still functions well, even with the tall, dense shrubs. A few years ago, nearby road construction altered the slope of the road carrying larger volumes of water into the garden. The increased flows have killed some of the vegetation and caused gullies to form, but the vegetation seems to have rebounded. It would be beneficial to the functionality of the garden to have the sediment vacuumed out and RRST has spoken with the City of Winooski DPW about this maintenance task. It is expected to be completed in spring 2019. In 2016, a group of UVM students in an Ecosystem Design course developed recommendations to repair the garden. There is no current adopter; and RRST coordinator will attempt to find one for the 2019 season.

### **Williston Town Hall Annex**

**Location:** 7900 Williston Rd, Williston



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This small garden near the entrance walkway to the Annex building and the parking lot has had an active adopter since 2014: Rita Desseau. Rita maintained the garden in 2018, but additional work needs to be done at this site to weed, thin larger shrubs, re-plant in bare spots, and mulch the garden.

### **Williston Library (aka. Dorothy Alling Memorial Library)**

**Location:** 21 Library Lane, Williston

The Williston Library garden is in good condition and is primarily being cared for by the staff of the library. The flowering plants may need to be thinned out in 2019. This garden was previously cared for by Andrew Wolf.

### **South Burlington High School** (formerly the location of the South Burlington Library)

540 Dorset St., South Burlington

WNRCD received a grant to construct a rain garden at the entrance to what was the South Burlington Library (now South Burlington High School) in 2013. The rain garden received minimal maintenance by the library staff over the years, and was formally adopted in 2016 by Amy Niggel's Cub Scout 678 pack. The pack's leadership changed hands in 2018 and the new cubmaster Bill Kett agreed to continue maintenance of the garden with his pack.

### **South Burlington Fire Department**

575 Dorset St., South Burlington

The City of South Burlington installed this bioretention area/rain garden in 2015 to improve stormwater management at the Fire Department. Cub Scout pack 678 volunteered to adopt this rain garden as well in 2019.

Rain Garden	Adopter 2018	Previous adopters
Chamberlin School, South Burlington	Chris Provost and students	Chris Provost
Coast Guard Station, Burlington	None	Wily Reading
Landry Park, Winooski	None	None
Williston Annex	Rita Dessau	Rita Dessau
Williston Town Library	Town Library Staff	Andrew Wolf
Callahan Park, Burlington	Brad Ketterling	Brad Ketterling
Farrell Park, South Burlington	None	None
Department of Corrections, South Burlington	None	Dana Scofield and Lori Farley
Brownell Library, Essex Junction	None	None



This document was prepared by the Winooski Natural Resources Conservation District, who is contracted by Chittenden County's MS4 Committee to run the RRST program.



South Burlington Fire Station	Cub Scouts 678 (Bill Kett)	Cub Scouts 678 (Amy Niggel)
South Burlington Library	Cub Scouts 678 (Bill Kett)	None

**Table 4: 2018 Rain Garden Adopters**

## 2018 Staffing Notes

In 2018, WNRCD experienced a full staff turnover. At the end of May 2018, Holly Kreiner left her position with WNRCD and was replaced by Kristen Balschunat. In July 2018, District Manager Corrina Parnapy left her position, and was replaced by Gianna Petito. Kristen has taken primary responsibility for Stream Team activities.



This document was prepared by the Winooski Natural Resources Conservation District, who is contracted by Chittenden County's MS4 Committee to run the RRST program.

## **B.3.4**

# **Illicit Discharge Detection and Elimination Activities Summary**



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**Permit # 7022-9014.A**  
**Minimum Control Measure 3 – Illicit Discharge Detection & Elimination (IDDE)**  
**Summary of 2018 Activities**

The City of Burlington contracted with Watershed Consulting Associates (WCA) in early 2018 to conduct initial IDDE assessments on the City's stormwater outfalls. WCA inspected a total of 107 stormwater outfalls, and submitted a final report on their findings in July of 2018. That initial report is attached.

Following review of WCA's report, the City expanded their contract to conduct advanced investigation on the outfalls where illicit discharges were suspected. WCA was able to conduct a substantial portion of this work in the fall of 2018, and provided the City with a summary report of their 2018 findings, which is included below.

IDDE work related to WCA's findings is ongoing as of the date of this report. Advanced investigation is scheduled to resume as soon as weather conditions improve, and the City will be allocating additional budget funds for FY 2020 to ensure the work is completed, and that the source(s) of any illicit discharges that are confirmed, are located and eliminated.

In addition to WCA's work, the City also submitted samples from targeted locations for Polymerase Chain Reaction (PCR) and Quantitative Polymerase Chain Reaction (qPCR) DNA testing, through the University of New Hampshire. Four sample locations were targeted following a series of high E.coli test results during the summer of 2018, which resulted in several beach closures. Initial assumptions were made regarding the relationship of these test results to reportable CSO events. However, City staff felt that the results at these particular locations was unusual due to their relative position to CSO areas, as well as the overall volume of the events involved. Therefore, the objective for this round of testing was to determine whether any of the locations of interest had elevated levels of E.coli bacteria from a human source, following a 72-hour period of dry weather.

Test results are also attached below. Only 2 of the 4 samples showed positive markers for human-sourced E.coli bacteria. Both locations, coincidentally, are also currently undergoing advanced investigation with WCA, as they are fed by an outfall with a suspect discharge. As stated previously, that process is still underway, and we will submit additional information as soon as it is available.

If there are any additional questions about the attached reports, or the IDDE activities the City is planning for 2019, please do not hesitate to contact us.



## Memorandum



To: Jenna Olson

From: Dana Allen, Watershed Consulting Associates, LLC

Date: July 25, 2018

Re: ***City of Burlington – Illicit Discharge Detection and Elimination (IDDE) – Outfall Reconnaissance Inventory***

### ATTACHMENTS:

**Attachment A-1: Burlington ORI Results – All Data – 6-29 to 7-25 2018**

**Attachment A-2: Burlington ORI Field Sheets – 6-29 to 7-25 2018**

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## 1.0 Introduction

On behalf of the City of Burlington, Watershed Consulting Associates, LLC (WCA) has completed an initial Outfall Reconnaissance Inventory (aka 'dry weather survey') for select outfalls in Burlington, VT.

**The results indicate that there are 7 outfalls with Obvious illicit discharge potential, 9 outfalls with a Possible illicit discharge, 84 outfalls with Unlikely potential for illicit discharge, and 4 outfalls that we were unable to assess for a variety of reasons.**

The goal of this study was to find any potential non-stormwater discharges, usually waters related to sanitary sewage, entering the stormwater sewer system, trace them back to their source, and eliminate them. Doing so improves the aquatic ecosystem health of the rivers and streams in those communities, and eliminates any potential public health hazards that could be associated with non-stormwater discharges that enter untreated into natural ecosystems.

The Outfall Reconnaissance Inventory or ORI, also referred to as the dry weather survey was conducted during dry weather (defined as <0.1" in the past 24 hours to the maximum extent practicable), with field tests performed on any flowing water found at the system's pipe outlet. These tests included chemical tests for ammonia, temperature, pH, and conductivity, qualitative tests for odor, turbidity, color, and floatables, as well as non-flow-based indicators such as outfall damage, deposits or stains, abnormal vegetation, poor pool quality, and pipe benthic growth. Where any of these indicators suggested a possible illicit discharge, a sample was taken for later analysis for methylene blue active substances (MBAS, which are detergent-related). Additional samples were also obtained, where indicated by the results of other analyses, for E. coli and total phosphorus. Occasionally optical brighteners were tested using unbleached cotton pads placed in an outfall and allowed to sit for 4-10 days. If any optical brighteners (substances typically associated with laundry detergent) were present, the pads would fluoresce under UV (black) light. Detailed methods can be found in the following section.



## 2.0 Methods

Our general methodology for this study follows the protocols and recommendations established by the Center for Watershed Protection (CWP), as well as additional guidelines developed over the course of several other studies by the State of Vermont.

Stormwater systems were assessed during dry weather to minimize dilution by large volumes of runoff. Dry weather was defined as <0.1" precipitation in the previous 24 hours to the maximum extent practicable. There were times during the study when outfalls were assessed when precipitation had marginally exceeded this amount – this was noted on the Outfall Reconnaissance Inventory reports. Surveys during these times were kept to a bare minimum and avoided whenever possible. Outfalls in the public right of way or along a water body were accessed via public land. Where portions of the stormwater system were on private land, permission was obtained prior to investigating the system. If access to property was denied, infrastructure within the public right of way was assessed.

WCA developed a digital smartphone-based application to use for the collection, storage, analysis, and reporting of survey data. This application, developed using a third-party software platform, is based on the CWP field and laboratory forms merged into one overall interface and accessed in the field using a smartphone or tablet device. This enabled field staff to quickly find each outfall or other infrastructure point using the phone's built-in GPS.

At every outfall point, the basic procedure was to search for the presence or absence of flow. If there was no flow during dry weather, it was generally assumed that there was no chronic illicit discharge present unless other non-flow-based indicators such as outfall damage, deposits or stains, abnormal vegetation, poor pool quality, or pipe benthic growth were noted. If none of these indicators was present, basic time/date information was entered into the application, along with a 'No' indicator for flow and non-flow based indicators and the outfall was assigned an overall characterization of 'Unlikely'.

If flow was present, immediate analysis for temperature, pH, specific conductance, and ammonia was conducted in the field. Other indicators, such as color, odor, turbidity, and floatables were noted as well. If any indicators were above established thresholds (see Table 1), a further sample was taken for analysis later that day for methylene blue active substances (MBAS, a detergent indicator).

In cases where other non-flow based indicators (listed above) were present, or a sample was not otherwise able to be obtained from a flow or pool, a cotton pad was placed in the line of assumed flow to capture intermittent discharges and analyze them for the presence of optical brighteners. WCA used this technique sparingly, as most outfalls, or other infrastructure, had adequate flow or a pool to sample from and the water could be analyzed for MBAS.

Additionally, WCA noted any non-IDDE issues at the outfall or structure such as erosion, structure damage, headwall collapses, etc.

### ***Water Quality Analysis Methods***

*Temperature/pH/Specific Conductance:*

The Hannah Instruments HI98129 Combo pH and EC meter was used for all three parameters. Fresh pH and conductivity buffers were ordered at the beginning of the study from Endyne Labs in Williston, VT to ensure accuracy using standard solutions at known specific conductivity ranges.

*Ammonia:*

Ammonia was measured immediately in the field using the LaMotte Colorimeter 1200 (Model 3680-01). This unit uses Nessler's reagent for the detection of ammonia using a color reaction that is then measured by the colorimeter. The range is 0-5ppm/0.05ppm NH<sub>3</sub>-N. Fresh reagents were maintained throughout the course of the study.

*Methylene Blue Active Substances (MBAS):*

The presence of detergents was determined using the Chemetrics R-9400 Detergents test which used a methylene blue active substances (MBAS) test, a method consistent with APHA Standard Methods, 21st ed., Method 5540 C (2005).

*Optical Brighteners:*

Where indicated WCA used cotton pads placed either in the potential flow path of water at the outfall or in the sump of a catchbasin where flow was anticipated. These pads were allowed to sit for a period of 4-10 days encased in a plastic-coated wire mesh pouch. After this period, pads were retrieved, rinsed, and dried, then exposed to a UV (black) light. In the presence of detergents, the pad will fluoresce to varying degrees. WCA did not attempt to make measurements of the relative amount of fluorescence – this test was only for presence or absence. However, fouling with other debris and dirt often made reading a result difficult. In most cases where there was generally reliable flow or pooled water in the catchbasin sump, the MBAS test was used. Some studies have indicated that it takes a relatively high concentration of optical brighteners to cause a pad to fluoresce under UV light (up to 50 mg/L), while the MBAS test is reliable ranging from 0 – 3 ppm. For this reason we tended to use it more frequently.

**Table 1: Water quality threshold values for determining possibility and nature of illicit discharges.**

Test	Threshold (US EPA)	Threshold (VT Specific Studies)	Notes
<i>E. coli</i> (MPN/100ml)	235	400	Wastewater (undiluted) will have levels far exceeding 400 MPN. However <i>E. coli</i> can occur due to animal waste entering the storm system through open catch basins. Additionally, there is some evidence which indicates that <i>E. coli</i> populations can survive in anaerobic sediment conditions found in streams, ponds, or other similar environments. <i>E. coli</i> is a difficult indicator to use in IDDE for these reasons.
<i>Ammonia</i> (mg/L)	0.1	0.25	Ammonia is an indicator of decomposition of organic matter. Decomposing landscaping vegetation within catch basins under anoxic conditions can cause elevated ammonia in water. This can cause misleading results. The threshold of 0.25 mg/L is only used when other indicators are present. Otherwise a value of 0.5 mg/L is the trigger for additional investigation.
<i>MBAS</i> (mg/L)	0.25	0.2	Anionic detergents are fairly commonly found at outfalls in low-flow conditions found during dry weather as they correlate with various outdoor washing practices (of cars, house siding, windows, and also windshield washing fluid). Higher levels (typically 0.5-0.75 mg/L or greater) can sometimes indicate wastewater discharges.
<i>Optical Brightener</i>	N/A	Presence	Presence of optical brighteners can indicate wastewater or wastewater contaminants as brighteners are contained in some hair conditioners, bleached paper products, and laundry detergents. Petroleum products will also cause fluorescence. Some studies indicate that a relatively high concentration of OB must be present for detection. We only use this test when other indicators are strongly present.
<i>Chlorine</i> (mg/L)	N/A	0.06	This test is used only in municipalities where municipal water is provided and chlorinated. This test was used very sparingly during this study as few of the towns chlorinated their water. As it degrades in the presence of organic materials, it's not a good wastewater indicator.
<i>Specific Conductance</i> (uS/cm)	>2000	600	Specific conductance can be elevated by road deicing materials, or metals from corrosion. It can help in determining some industrial discharges but is primarily used in conjunction with other strong indicators.

### 3.0 Results

The following table outlines the outfalls where either an Obvious or Possible illicit discharge may be occurring. Please note that we are making this characterization based solely on the water quality results and not any advanced investigation that could definitively identify a source of an illicit discharge. Performing that work was outside the scope of this study.

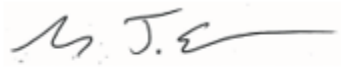
**Table 2: Burlington ORI results as of 7-29-18.**

Outfall Code	Status	pH	Conductivity (uS/cm)	Ammonia (mg/L)	MBAS (ppm)	E. coli (MPN)	OB (Y/N)	Notes
LC42.0	Obvious	5.92	2212	2.7	1	>2400	N/A	
LC47.0	Obvious	7.8	2073	1.17	0.75	>2400	N/A	
EB9.0	Obvious	8.8	2975	1.669	2	16	N/A	
WR20.0	Obvious	7.66	1621	0.35	0.25	1100	N/A	
PB3.0	Obvious	7.45	3995	1.76	1	51	N/A	
LC9.0	Obvious	8.02	1230	0.47	0.5	>2400	N/A	
LC3.0	Obvious	7.1	750	0.53	0.25	>2400	N/A	
WR26.0	Possible	7.72	3999	0.04	N/A	N/A	N/A	
WR9.0	Possible	8.28	3217	0.27	1	1	N/A	
LC19.0	Possible	8.05	2083	0.23			N/A	
WR11.0	Possible	7.33	1934	5	0.5	2	N/A	Reddish staining of water may have lead to high ammonia reading.
LC14.0	Possible	8.12	3380	0.26	1	200	N/A	
LC14.2	Possible	7.82	3999	0.32				Pipe outfall next to LC14.0 -Not tested for MBAS/E. coli - not part of original scope
EB5.0	Possible	7.65	1226	0.24	0.25	1200	N/A	
Other_OF_118	Possible	7.9	2602	1.17	0.25	N/A	Indeterminate	Outfall from stormwater pond on Flynn Avenue.
LC38.0	Possible	7.02	435	0.4	1	N/A	N/A	
LC46.0	Possible	7.43	2170	0.56	3	N/A	N/A	

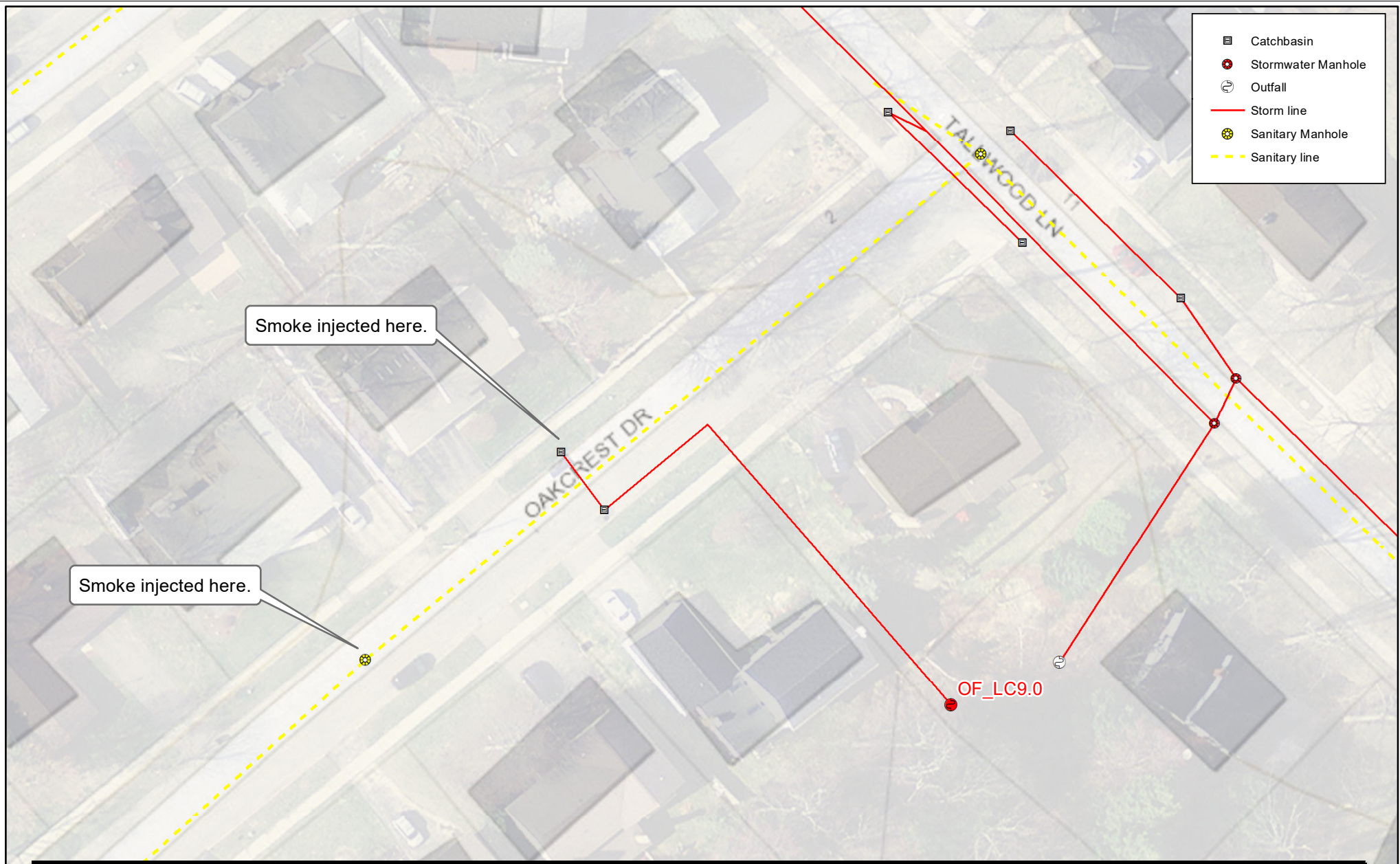
A table of all results can be seen in Attachment A-1: Burlington ORI Results – All Data – 6-29 to 7-25 2018 (Excel file with two worksheets – one with ‘Reduced’ data showing only pertinent data while the other lists all data as exported from the field app). Additionally, field data sheets for each outfall visited can be seen in Attachment A-2: Burlington ORI Field Sheets – 6-29 to 7-25 2018 (as a PDF, searchable by outfall code).

Please feel free to give me a call at (802) 497-2367 or email at [dana@watershedca.com](mailto:dana@watershedca.com) with any questions.

Sincerely,

A handwritten signature in black ink, appearing to read "D. Allen", is written over a light beige rectangular background.

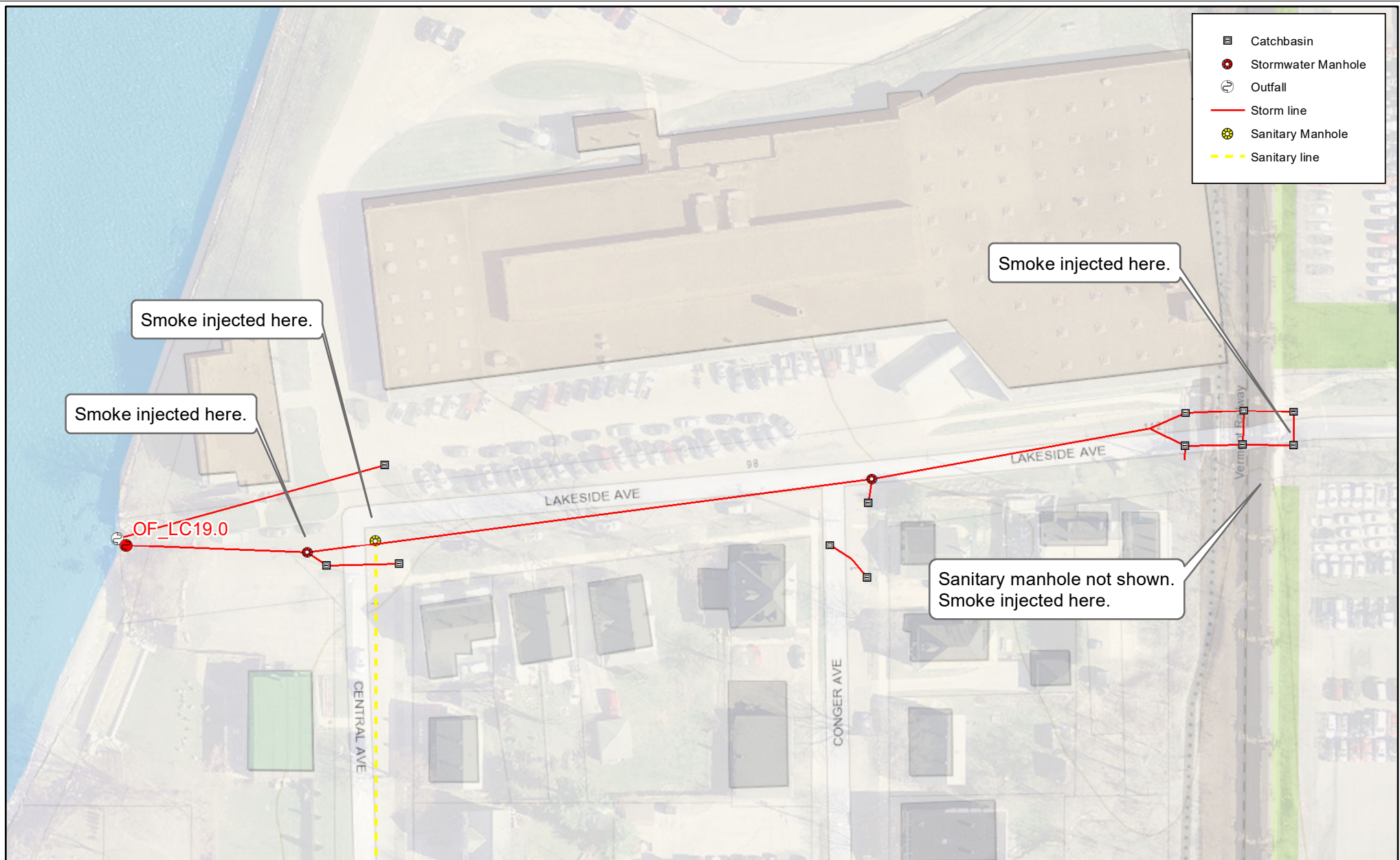
Dana Allen  
Water Quality Project Manager



- Catchbasin
- Stormwater Manhole
- Outfall
- Storm line
- Sanitary Manhole
- Sanitary line

Infrastructure ID	Date	Flow?	pH	Conductivity (uS/cm)	Ammonia mg/L	Detergents (ppm)	Bacteria (MPN)	Phosphorus (mg/L)	Optical Brightener (Y/N)?	Canine Alert?
OF_LC9.0	2018-07-10	yes	8	1230	0.47	0.5	2400	N/A	N/A	N/A



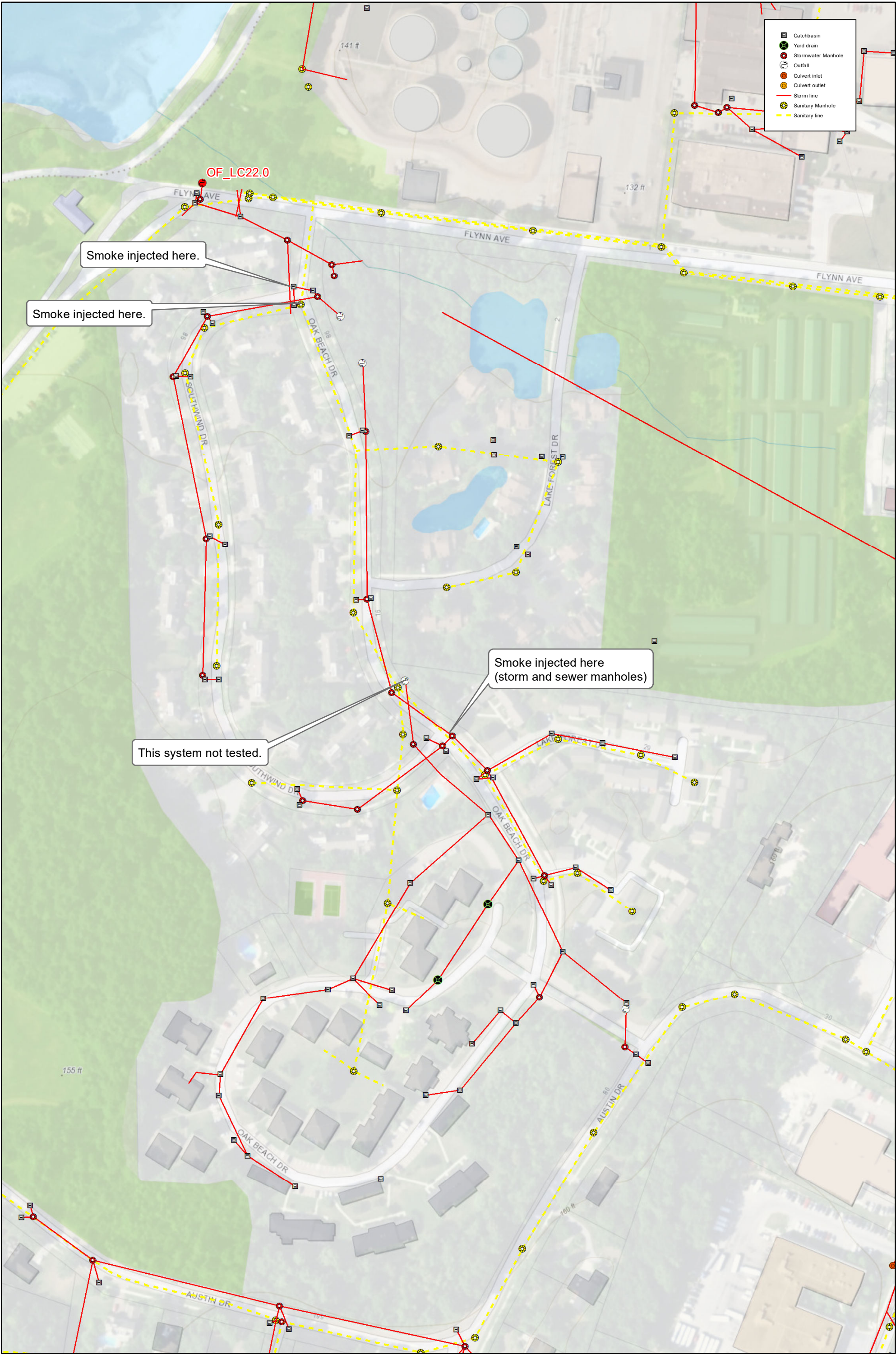


Infrastructure ID	Date	Flow?	pH	Conductivity (uS/cm)	Ammonia mg/L	Detergents (ppm)	Bacteria (MPN)	Phosphorus (mg/L)	Optical Brightener (Y/N)?	Canine Alert?
OF_LC19.0	2018-07-03	yes	8.05	2083	0.23	1	N/A	N/A	N/A	N/A



BTV IDDE AI - Summary Map  
LC19.0



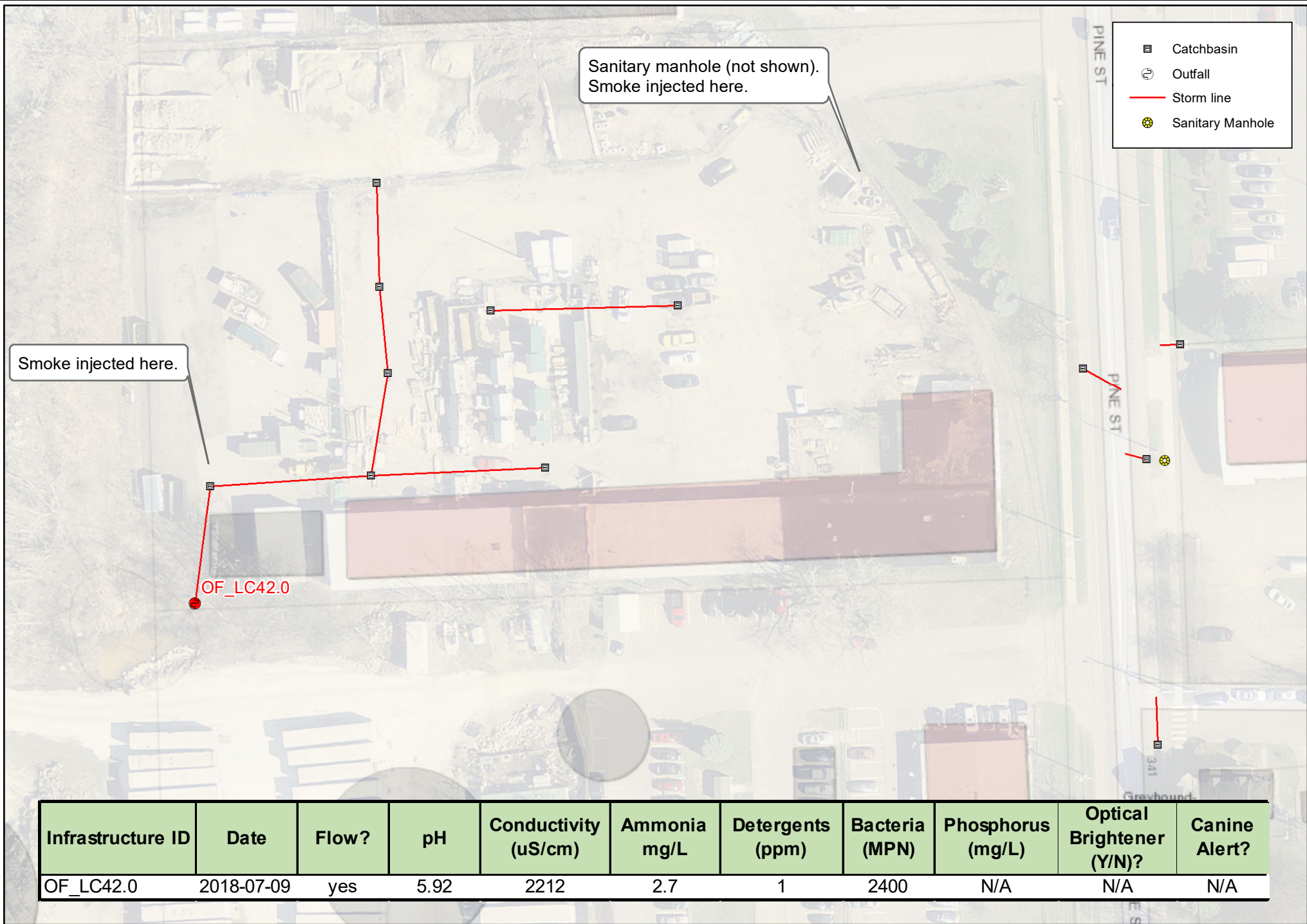


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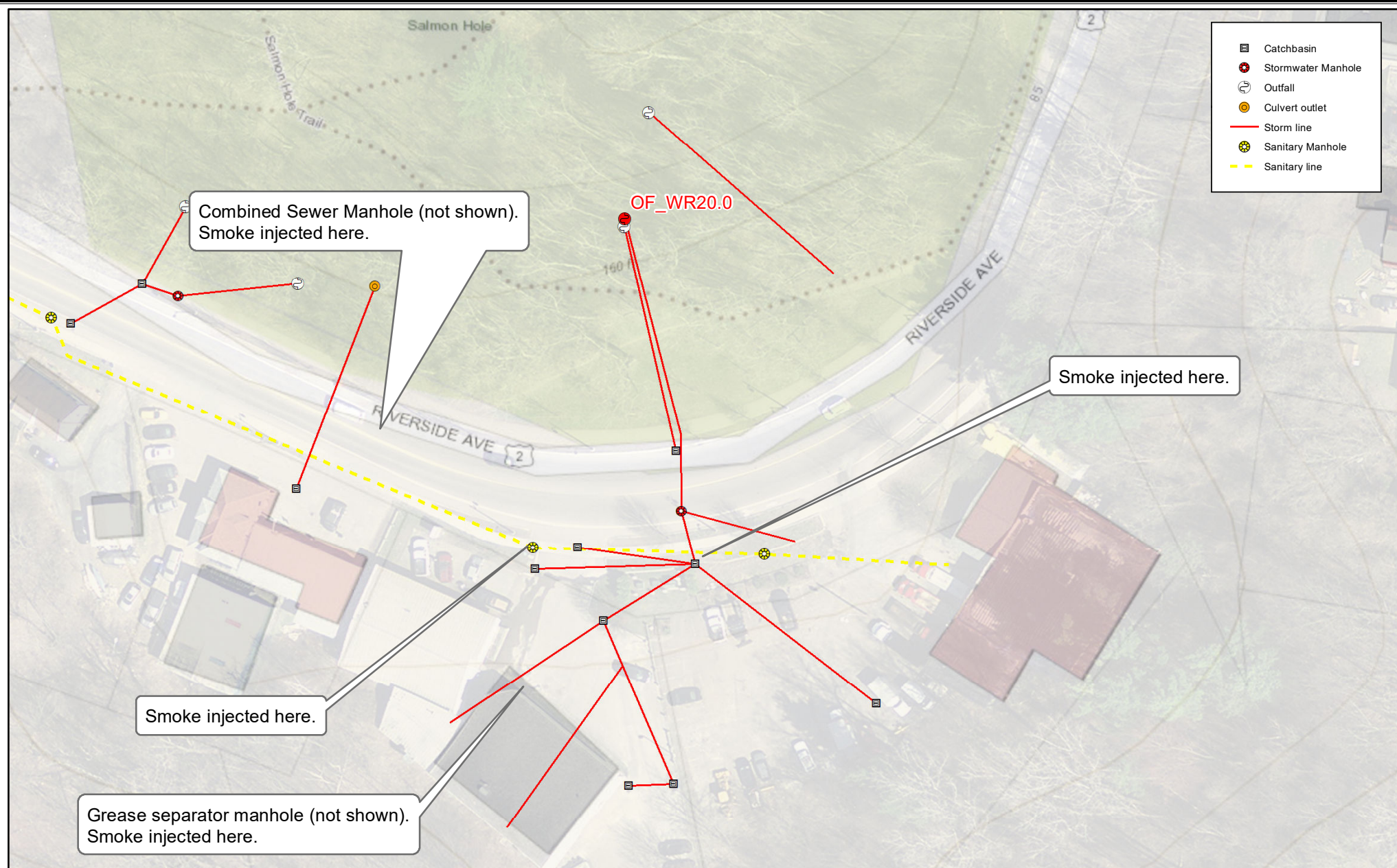
BTV IDDE AI - Summary Map  
LC22.0





BTV IDDE AI - Summary Map  
LC42.0



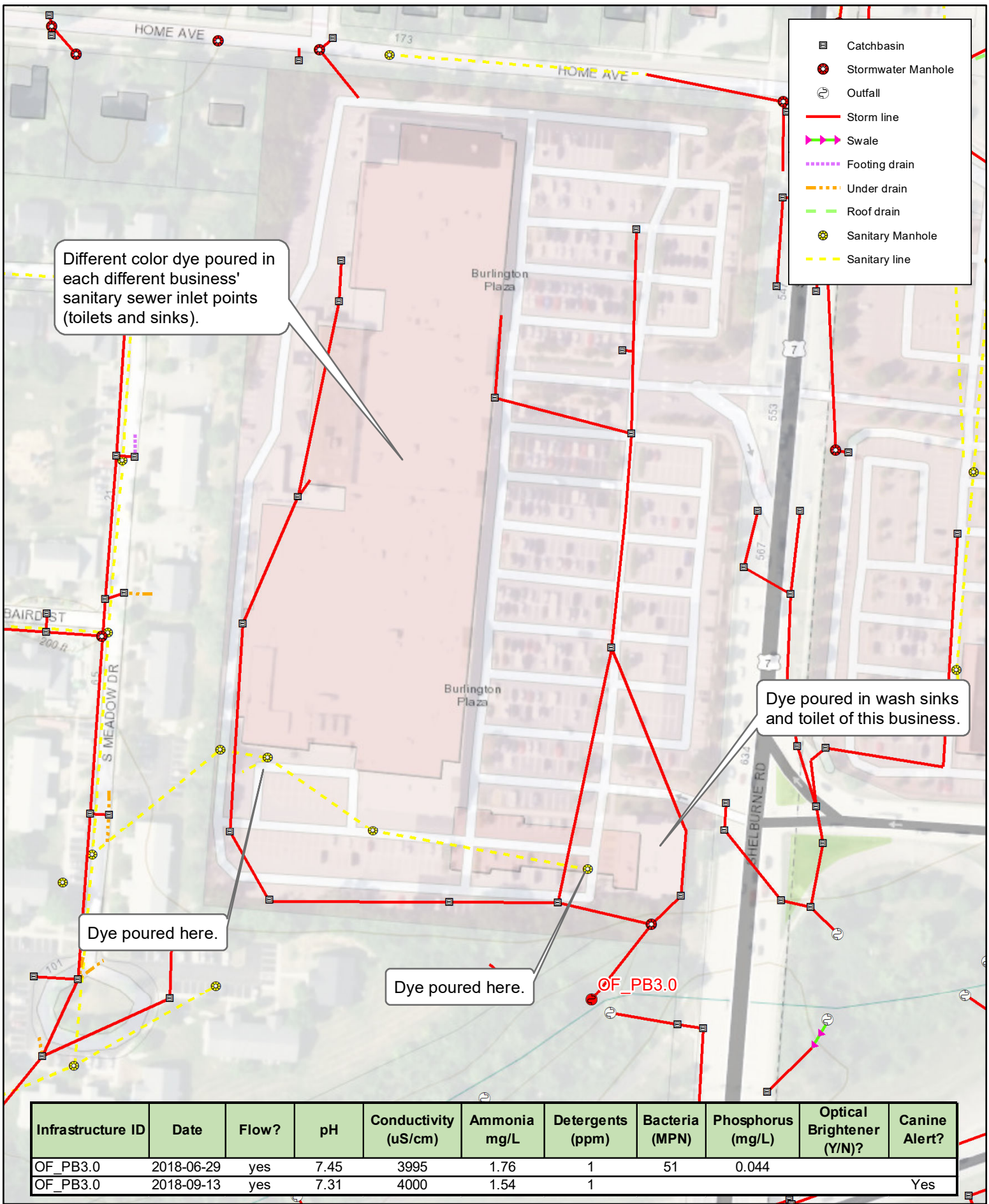


Infrastructure ID	Date	Flow?	pH	Conductivity (uS/cm)	Ammonia mg/L	Detergents (ppm)	Bacteria (MPN)	Phosphorus (mg/L)	Optical Brightener (Y/N)?	Canine Alert?
WR20.0	7/9/2018	yes	7.66	1621	0.35	0.25	1100	N/A	N/A	No

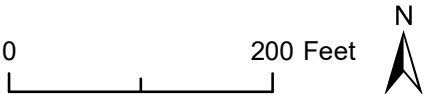


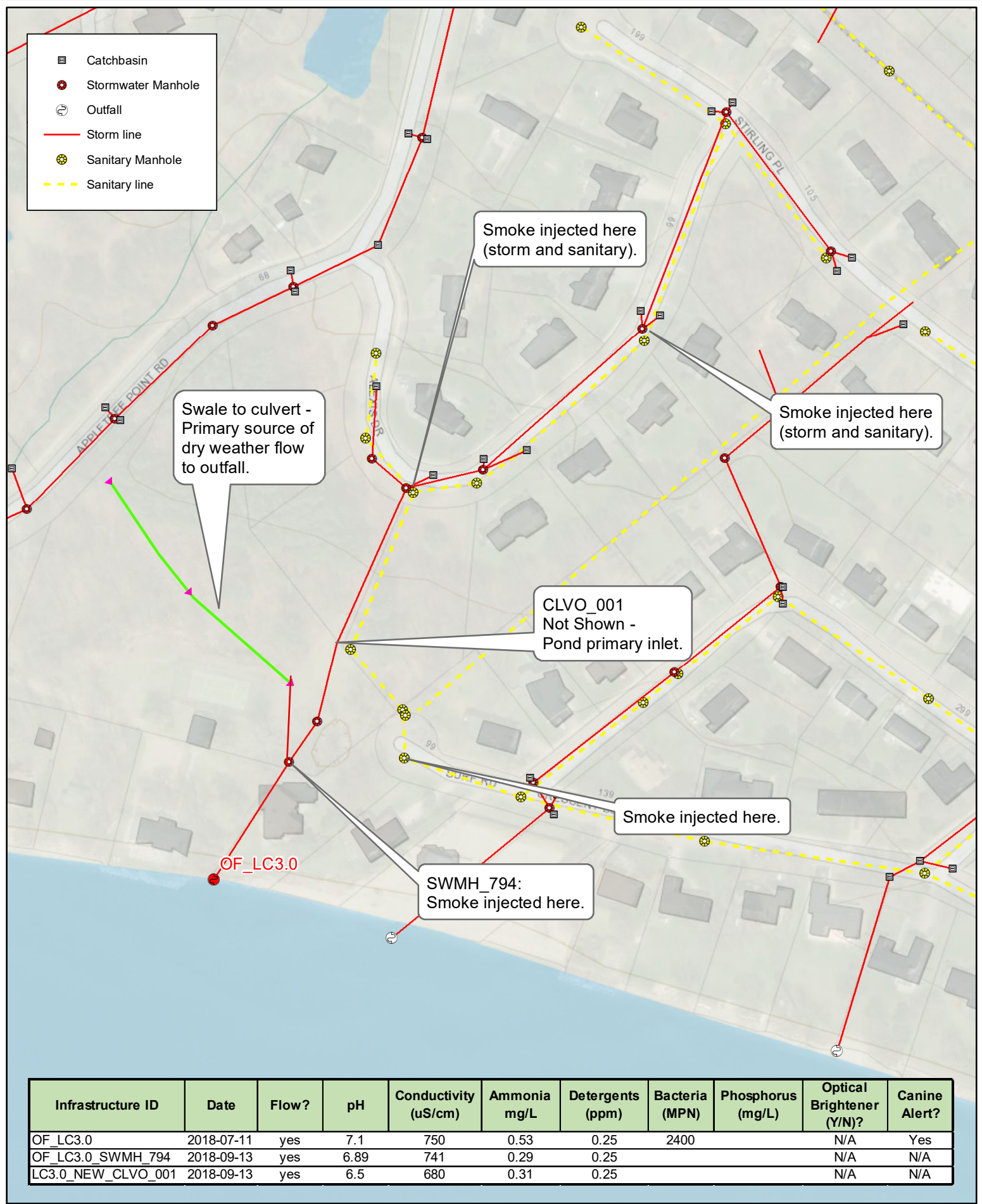
BTV IDDE AI - Summary Map  
WR20.0



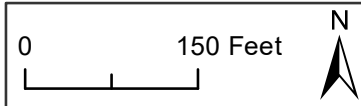


Infrastructure ID	Date	Flow?	pH	Conductivity (uS/cm)	Ammonia mg/L	Detergents (ppm)	Bacteria (MPN)	Phosphorus (mg/L)	Optical Brightener (Y/N)?	Canine Alert?
OF_PB3.0	2018-06-29	yes	7.45	3995	1.76	1	51	0.044		
OF_PB3.0	2018-09-13	yes	7.31	4000	1.54	1				Yes





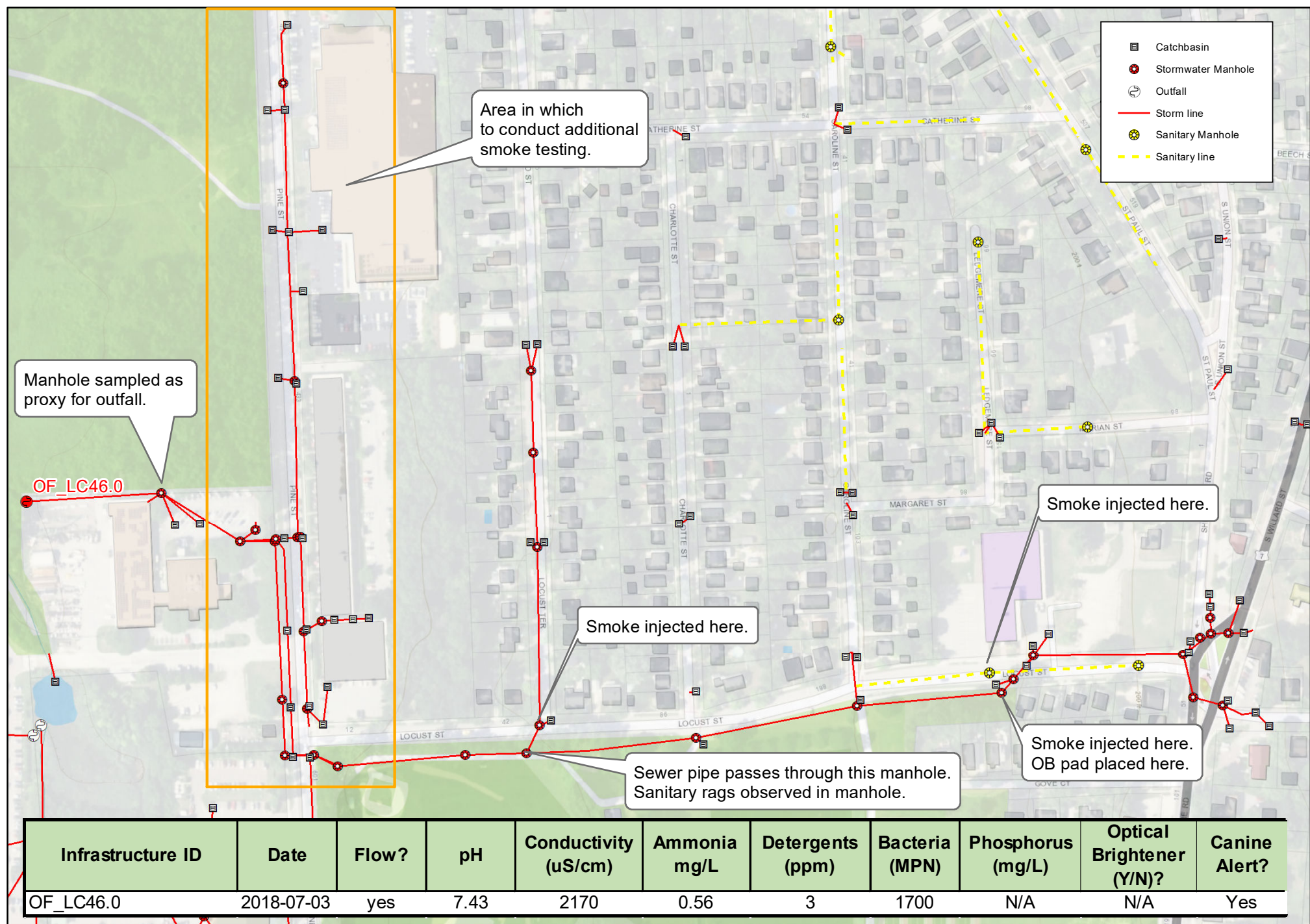
Infrastructure ID	Date	Flow?	pH	Conductivity (uS/cm)	Ammonia mg/L	Detergents (ppm)	Bacteria (MPN)	Phosphorus (mg/L)	Optical Brightener (Y/N)?	Canine Alert?
OF_LC3.0	2018-07-11	yes	7.1	750	0.53	0.25	2400		N/A	Yes
OF_LC3.0_SWMH_794	2018-09-13	yes	6.89	741	0.29	0.25			N/A	N/A
LC3.0_NEW_CLVO_001	2018-09-13	yes	6.5	680	0.31	0.25			N/A	N/A



BTV IDDE AI - Summary Map  
LC3.0





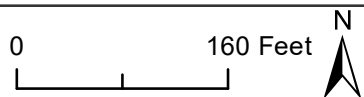


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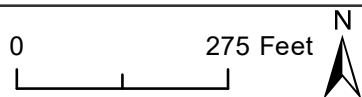
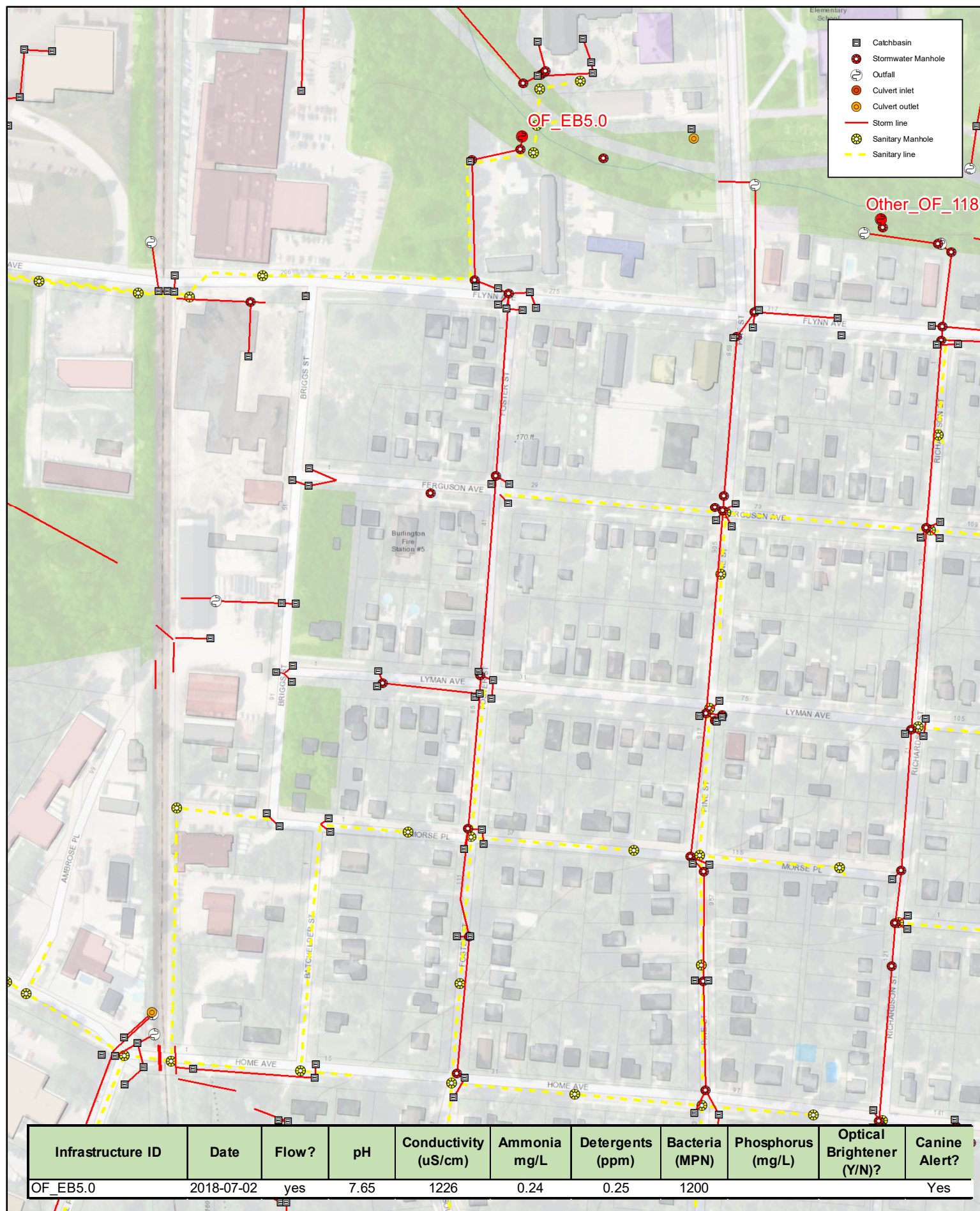
BTV IDDE AI - Summary Map  
LC46.0





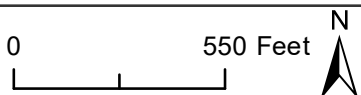
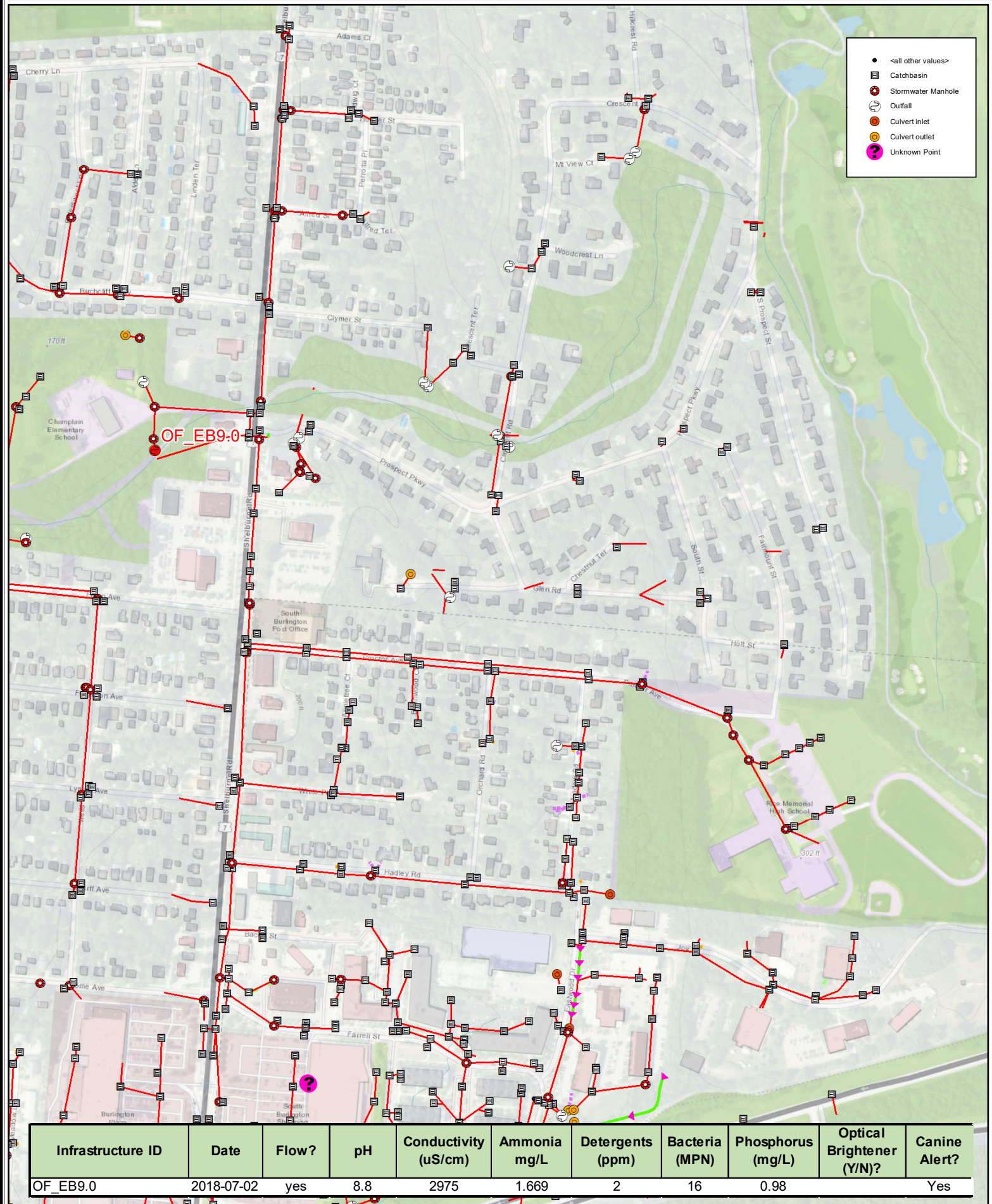
BTV IDDE AI - Summary Map  
LC47.0





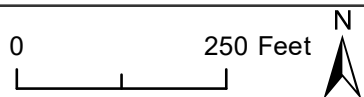
BTV IDDE AI - Summary Map  
EB5.0





BTV IDDE AI - Summary Map  
EB9.0





BTV IDDE AI - Summary Map

Other\_118

PCR / qPCR Testing Results - 2018

[illegible]



# PCR / qPCR Test Locations

## **B-VT 1**

Pine Street Barge Canal – discharge from  
weir to Lake Champlain





## B-VT 2

Blodgett Beach – in water



## B-VT 3

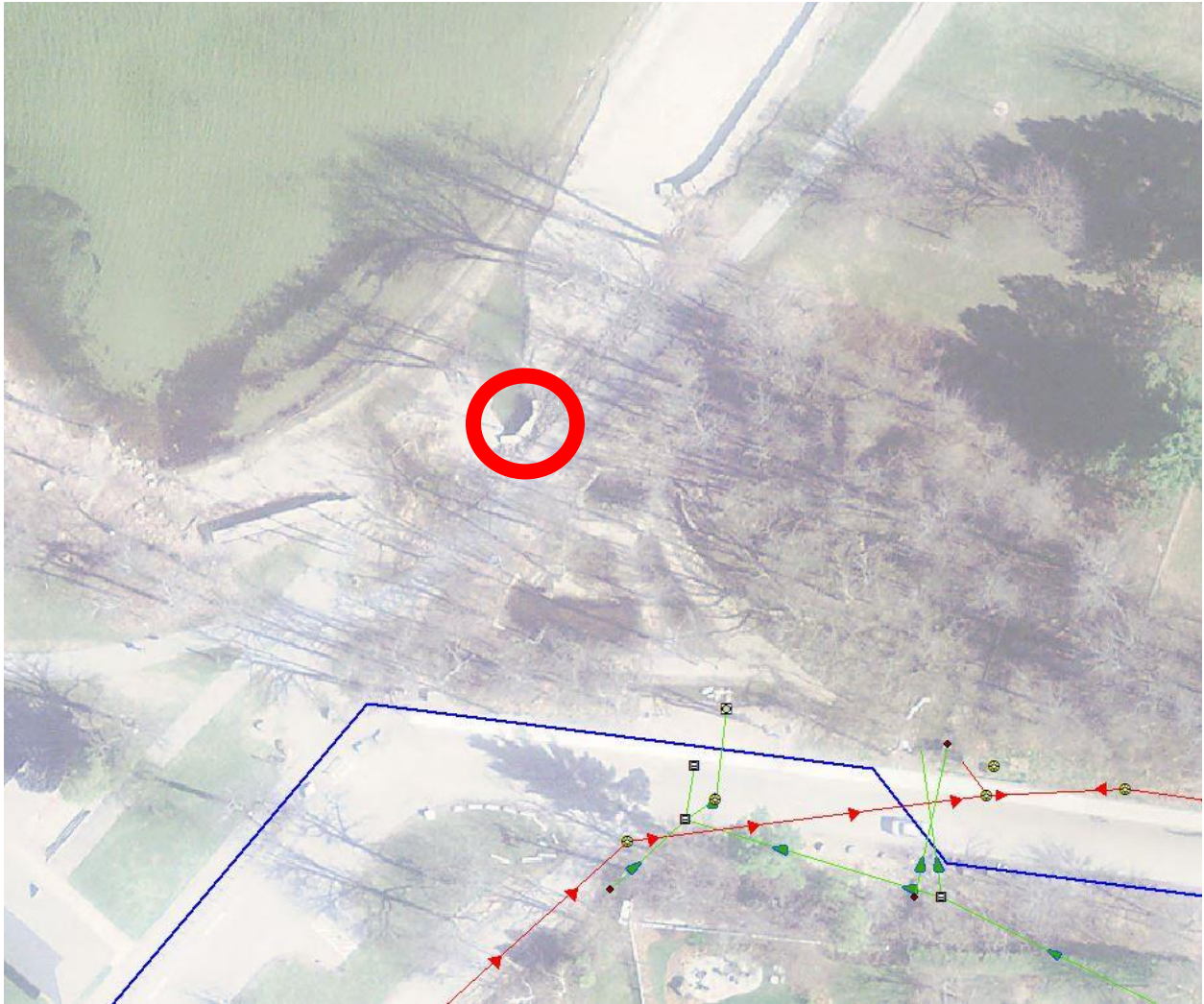
Englesby Brook @ confluence with  
Lake Champlain





## B-VT 4

Oakledge Park – Blanchard Beach outfall





## **B.4.2 & B.5.2**

# Construction Site Runoff Control & Post-Construction Management Summary



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**Permit # 7022-9014.A**  
**Minimum Control Measures 4 & 5 – Construction Site & Post-Construction Management**  
**Summary of 2018 Activities**

The City of Burlington has continued implementation under its Chapter 26 Ordinance of both construction and post-construction reviews and approvals for sites that do not meet State thresholds for requiring stormwater permit coverage.

The following tables summarize the City's project review and site inspection activities completed during 2018.

<b>Project Reviews Completed – 2018</b>	
<b>Project Type</b>	<b>Reviews Completed</b>
Construction – EPSC	61
Post-Construction – PCSW	29

<b>Inspection Activities Summary – 2018</b>	
Total Post-Construction Systems Inspected	116
Total Maintenance Requests Issued	21
Total Construction Inspections	19